



# MDC Resource Science

## Flood Tolerance of Oak Seedlings From Bottomland and Upland Sites

### Science Notes



# Flood Tolerance of Oak Seedlings From Bottomland and Upland Sites

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## Objectives:

- 1) To determine if seed source (bottomland vs. upland) affects seedling survival and growth following flooding.
- 2) To determine if differences in flood tolerance exists between swamp white, bur, and white oaks.

## Summary

Artificial regeneration of oak species in floodplains presents numerous challenges because of the seasonal flooding associated with these areas. Utilizing not only flood-tolerant oak species, but also flood tolerant seed sources of the oak species, may serve to enhance seedling survival and growth rates. Despite the importance of these factors to hardwood forest bottomland restoration projects, few studies have investigated the species' variation to flood tolerance and flood tolerance associated with seed sources originating from contrasting topographic positions for oaks.

This study examined flood tolerance for seedlings of swamp white oak, bur oak, and white oak grown from acorns collected from both upland and bottomland sites. Three-month-old containerized seedlings grown in a soil-less potting mix were subjected to a partial inundation for 0, 4, and 8 weeks with stagnant water in a shade house covered with 50 percent shade fabric.

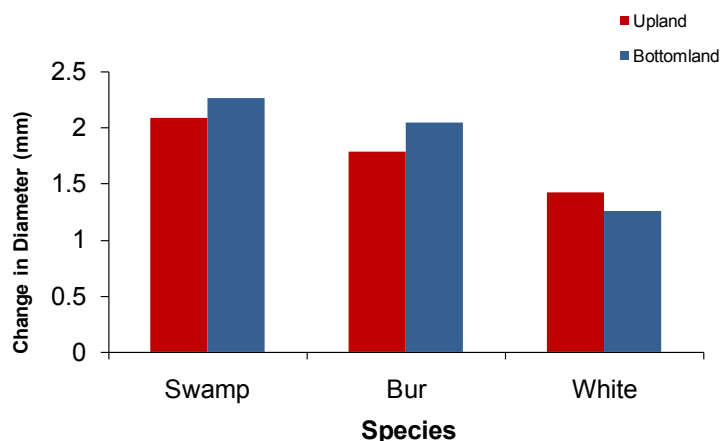


Figure 1: Average change in stem diameter swamp white, bur, and white oak seedlings grown from acorns collected on bottomland and upland sites following four weeks of flooding.

Mortality due to flooding was low for all species (<10%). Bur and swamp white oak seedlings originating from bottomland sites outperformed their upland counterparts in growth in all three flood treatments, while white oak seedlings from

upland seed sources outperformed the seedlings from bottomland seed sources after flooding (Figure 1).

Swamp white oak seedlings had the largest increase in diameter growth with increased flood duration while bur oak had moderate increase and white oak seedlings had a reduction in basal diameter growth with increased duration of flooding (Figure 2). Bur and white oak seedlings had a decrease in root dry weight with flooding duration. However, swamp white oak seedling root dry weight had no change in root dry weights from the four-week flooding treatment to the eight-week flooding treatment. The ability of swamp white oak seedlings to continue to add biomass to their root systems independent of flooding for four or eight weeks indicates it is a well-suited species for outplanting on bottomland sites that are prone to flooding for periods of four to eight weeks during the growing season.

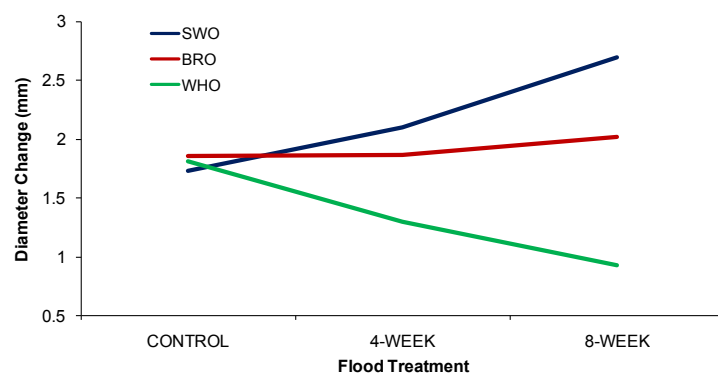


Figure 2: Average first-year change in stem diameter for swamp white, bur, and white oak seedlings following 0, 4, or 8 weeks of partial inundation.

## Management Findings

Study results show that 1) seed collected from bottomlands should be favored when purchasing wild seed for planting in bottomlands, and 2) swamp white oak is an excellent choice for planting and restoring bottomlands, while bur oak is a moderate choice and white oak a poor choice.

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